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Intermittent harvest in rural aquaculture in Malawi for better household nutrition

Innovative, inexpensive, and easy-to-use fish trap improves aquaculture production and allows households to harvest fish more often – for consumption or income generation.

The challenge

In a fish-loving country like Malawi, where fish is the main source of animal protein, but fisheries yields are in decline, great hope and effort is placed in the development of aquaculture. Better access to and regular consumption of fish, which is an important source of protein and essential micronutrients, can make an important contribution to overcoming development challenges. And food insecurity is one of the greatest in terms of public health. Women and children are particularly affected by malnutrition.

The expansion and promotion of sustainable aquaculture represents an important approach to meeting a growing demand for fish. This development requires – among many other aspects – innovations that contribute to successfully mastering challenges in the sector. With a focus on rural aquaculture, the Aquaculture Value Chain for Higher Income and Food Security Project in Malawi (AVCP), part of the Global Programme 'Sustainable Fisheries and Aquaculture' under the special initiative 'One World – No Hunger' of the German Ministry for Economic Cooperation and Development, is providing technical training to 4,500 small-scale producers in Malawi. Fish farming helps them improve both income and food security. One of the common and complex challenges in rural aquaculture is the use of mixed-sex *Tilapia* fingerlings in low-input systems. This means that farmers only have a limited selection and quantity of agricultural by-products available with which to feed a rapidly growing fish population in the pond. This leads to increasing competition for oxygen and food, which leads to poor growth rates and often an acceleration of sexual maturity. Accordingly, final harvests often consist of rather small fish, which does not meet the widespread expectations of harvesting edible – "*plate filling*" – fish from aquaculture.

Given the unavailability or prohibitiveness of mono-sex fingerlings, fish feed and aerators in rural aquaculture, the project was challenged to find an alternative solution to improve the productivity of rural aquaculture and its contribution to household nutrition.

Our idea

Based on expert discussions and literature research, the idea was born to build and test a size-selective fish trap to regularly harvest the juveniles of the initial fish stock. This innovation is thought to control the stocking density, to optimize the use of supplementary feeds, and to not exceed the carrying capacity of the pond. Ideally, a successful application of the fish trap would result in households increasing their overall aquaculture productivity, whilst harvesting small quantities of small fish much more regularly than has been customary in aquaculture to date. The intermittently harvested fish can be consumed within the household or used to generate small amounts of regular income. Meanwhile, the initial fish stock (parent fish) will be grown to a larger size for the final harvest.

Photo: © Emmanuel Banda

Picture: Family using the trap to catch fish.

Project names	GIZ Sector Project "Sustainable Fisheries and Aquaculture" & GIZ Project "Aquaculture Value Chain for Higher Income and Food Security in Malawi (AVCP)
Commissioned by	Federal Ministry for Economic Cooperation and Development (BMZ)
Project region	Malawi
Lead executing agencies	GIZ, Department of Fisheries (DoF), National Aquaculture Center (NAC), Lilongwe University of Agriculture and Natural Resources (LUANAR), Mzuzu University
Duration	01.01.2018 – 10.2023

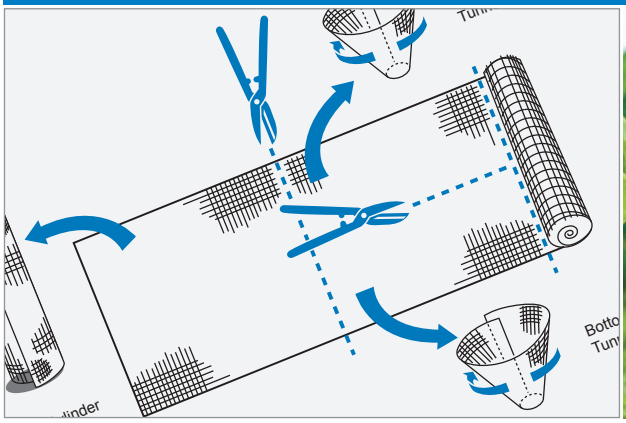


Photo: © Emmanuel Banda

Picture: Preparing the fish trap.

Our approach

Crafting the fish trap

The trap is made from wire mesh and shaped like a cylinder. Two additional wire mesh pieces shaped like a cone are attached at both ends. The diameter of the narrower end is kept smaller to allow only small fish to enter the trap. To lure them in, bait is placed inside. A piece of a net holds the bait. A string is fixed to the trap so that users can easily sink and retrieve the trap.

On-station trials

In a series of experiments conducted at the National Aquaculture Center in Domasi, the project team tested the trap for intermittent harvest with different baits in ponds (200 m^2) stocked with different species (*Coptodon Rendalli* vs. *Oreochromis Shiranus*) at different densities (*1 vs. 2 vs. 3 fish per sqm.*). In addition, further tests were carried out to determine the time and intervals it takes to catch a certain amount of fish. As a control and for comparison, additional ponds were stocked with *O. Shiranus* and *C. Rendalli* fed with maize bran or pellets for single batch harvest to represent customary forms of rural aquaculture in Malawi.

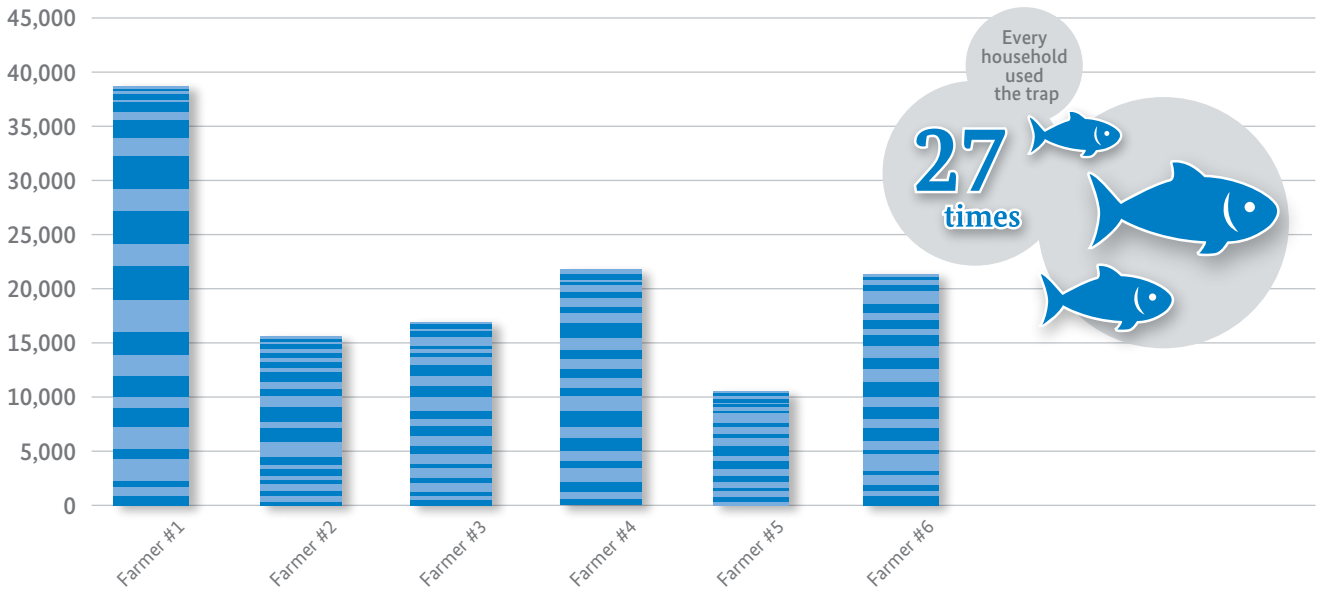
On-farm trials

At the time when the trap was technically functional, households that wanted to test the trap under everyday, real-life conditions were identified. Over three months, six households tested the trap and documented the catch.

Results

Under the application of the trap for intermittent harvest, the best results were achieved with the following combination of variables: maize bran (supplementary feed) x maize bran (trap bait) x *O. Shiranus* (species) x 2 fish/m^2 (stocking density).

Figure 1: Fish caught with trap by six households (stacked and total, in grams)



Photos: © Emmanuel Banda

L. to r.: Fish trap in action – left for 2 hours in the pond.

The total yields under this combination were 25 percent higher than in the control group with single batch harvest. A higher stocking density (3 fish/ m^2) led to a slightly higher total harvest in the control group, but to a lower net profit. The use of pellets reinforced both effects and was the least economical.

Results from the on-farm trials (see Figure 1) have demonstrated the functionality and the excellent catch effect of the traps. Over the three-month on-farm trial period, the trap was used 2 to 3 times a week and a total of 27 times. On average, around 120 small fish – an equivalent of 820 grams – were caught each intermittent harvest. With the use of the trap, all households reported that they now eat fish twice a week. Before that, fish consumption was between one and four times a month.

The benefits

- Reducing the competition for oxygen and food among the fish in the pond and thus measurable increase in yield
- Improved household consumption of small, nutritious fish and better cash flow

Success factors

- Traps are easy and inexpensive to build (USD 3)
- Traps are easy to use, also for women
- Directly tangible added value thanks to easy and regular access to fish

Examples from the field

Overall, the user experience of households engaged in the on-farm trials was very positive:

"As a family we are now able to eat fish twice and sometimes even three times a week as compared to the previous months without the technology when we ate fish only once per month." (Doud Milambe)

"Catching fish is so simple using the fish trap and even women and children can use it." (Jacqueline Jarasi)

"It is fast and effective compared with the hook and line method which I used to catch fish for home consumption that could take three to four hours but to catch only three fish and thus not enough for my household size." (Hassan Jarasi)

L. to r.: A family shows their "catch of the day" for their own consumption.

Photos: © Emmanuel Banda

Photo: © Emmanuel Banda

Picture: Family eating fish for lunch.

Contextual classification

The fish trap presented represents an evolution of existing harvesting methods. In capture fisheries around the world and to some extent in aquaculture, the use of fish traps has proved beneficial in many ways. Unlike active fishing gear, such as seines, the fish traps require less labor and energy, which makes them very efficient in terms of catch effort. In addition, the fish traps do not physically harm the caught fish, so the fish can be taken out of the trap alive and in good health. Early experiments on partial harvests in aquaculture in Malawi date back to the 1990s, when different tools for intermittent harvest were tested. However, due to the inefficiency and labor-intensity of the methods, there has been no broad application or further developments.

Summary

The trials confirmed the functionality and ease of use of the fish trap in context of small-scale aquaculture in Malawi. The advantage of the trap is that it enables households to easily harvest and consume fish from their own production more regularly without adversely affecting productivity. Alternatively, or even additionally, the households can sell the intermittently harvested fish, or part of it. This improves their cash flow whilst neighbors benefit from an improved fish supply. The innovation can therefore be described as a convenient tool that can make an effective contribution to food security in Malawi.

For more information please visit:
Intermittent Harvest of small Tilapia for better production & household nutrition – YouTube
https://www.youtube.com/watch?v=DvNcMcCPI28

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